

Multiple-Choice Test

Chapter 03.04 Newton-Raphson Method

- The Newton-Raphson method of finding roots of nonlinear equations falls under the category of _____ methods.
 - bracketing
 - open
 - random
 - graphical
- The Newton-Raphson method formula for finding the square root of a real number R from the equation $x^2 - R = 0$ is,
 - $x_{i+1} = \frac{x_i}{2}$
 - $x_{i+1} = \frac{3x_i}{2}$
 - $x_{i+1} = \frac{1}{2} \left(x_i + \frac{R}{x_i} \right)$
 - $x_{i+1} = \frac{1}{2} \left(3x_i - \frac{R}{x_i} \right)$
- The next iterative value of the root of $x^2 - 4 = 0$ using the Newton-Raphson method, if the initial guess is 3, is
 - 1.5
 - 2.067
 - 2.167
 - 3.000
- The root of the equation $f(x) = 0$ is found by using the Newton-Raphson method. The initial estimate of the root is $x_0 = 3$, $f(3) = 5$. The angle the line tangent to the function $f(x)$ makes at $x = 3$ is 57° with respect to the x -axis. The next estimate of the root, x_1 most nearly is
 - 3.2470
 - 0.2470
 - 3.2470
 - 6.2470

5. The root of $x^3 = 4$ is found by using the Newton-Raphson method. The successive iterative values of the root are given in the table below.

Iteration Number	Value of Root
0	2.0000
1	1.6667
2	1.5911
3	1.5874
4	1.5874

The iteration number at which I would first trust at least two significant digits in the answer is

- (A) 1
 (B) 2
 (C) 3
 (D) 4
6. The ideal gas law is given by

$$pv = RT$$

where p is the pressure, v is the specific volume, R is the universal gas constant, and T is the absolute temperature. This equation is only accurate for a limited range of pressure and temperature. Vander Waals came up with an equation that was accurate for larger ranges of pressure and temperature given by

$$\left(p + \frac{a}{v^2}\right)(v - b) = RT$$

where a and b are empirical constants dependent on a particular gas. Given the value of $R = 0.08$, $a = 3.592$, $b = 0.04267$, $p = 10$ and $T = 300$ (assume all units are consistent), one is going to find the specific volume, v , for the above values. Without finding the solution from the Vander Waals equation, what would be a good initial guess for v ?

- (A) 0
 (B) 1.2
 (C) 2.4
 (D) 3.6

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